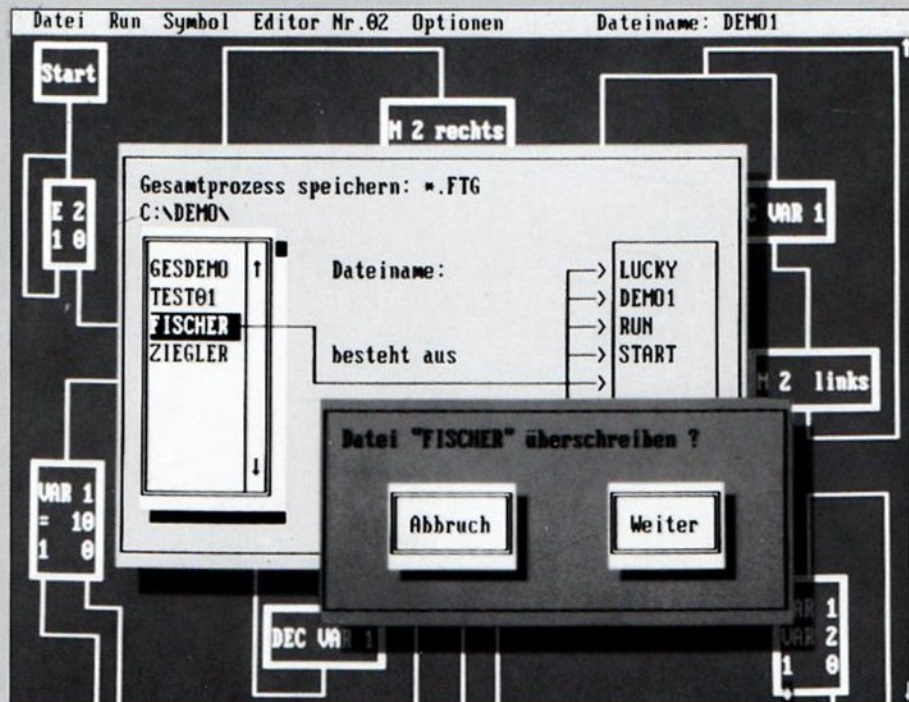


HANDBOOK / MANUEL / HANDBOEK

LUCKY LOGIC



fischertechnik[®] [®]

LUCKY LOGIC

LUCKY LOGIC

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LUCKY LOGIC

English version

IBM / ATARI

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Lucky Logic makes control so simple

The Lucky Logic program controls your fischertechnik models via the fischertechnik interface connected to the computer. Lucky Logic has an interactive user interface which is extremely simple to use; almost all actions can be performed with the mouse. All the program functions can be called up via menus. More experienced users can also call all the menu commands directly by means of hotkey codes (listed in the menus).

In order to be able to control a fischertechnik model, the computer needs some means of informing the interface which motors are supposed to turn and which lamps are supposed to light up. The computer can find out the positions of the different parts of a model by interrogating switches and light barriers. You can determine what you want your model to do by arranging the various switches, lamps and motors on the screen in the form of graphic symbols and then drawing connectors with the mouse, so that they look like a circuit with proper wires. The control program follows the connectors you have drawn according to the signals at the interface inputs, in order to activate the motors and lamps. If the state of an input changes, the signals take a different path through the drawing on the screen (the model is controlled by the computer). Lucky Logic also contains other elements for controlling the flow, namely variables, software counters and branches. You can design loops if you like by drawing return paths.

Installation

Lucky Logic is available for three different types of computer:

- IBM PC computers and compatibles,
- Atari ST,
- Commodore Amiga 500/2000/3000.

The package therefore contains four disks one 5 1/4" disk for PCs and one 3 1/2" disk each for PCs, Ataris and Amigas. The procedure for installing Lucky Logic on your computer differs according to the type of computer you have.

***Important!** You should make a backup copy of the disk before installing Lucky Logic. Your computer manual will tell you how to do so.*

The files and programs for PC-compatible computers have been compressed (squeezed together), so that there is room for them all on a single 5 1/4" disk. You must therefore "unpack" the disk before you can use the programs. To do so, insert the disk in the A drive, and change to A: if it is not already the active drive:

A: <—|

(The <—| symbol stands for the Enter key.) Then start the installation program. You must specify the language if you want to use a non-German version of Lucky Logic:

INSTALL	<—	for German
INSTALL E	<—	for English
INSTALL F	<—	for French
INSTALL N	<—	for Dutch

The installation program now asks you where you want to copy the programs and files (i.e. to a floppy disk or to the hard disk). This still works even if you only have one disk drive - in this case, the computer switches it back and forth between A and B. A separate subdirectory is created if you copy Lucky Logic to the hard disk.

If you use the Atari version, the disk already has the right format. Simply insert it in the disk drive, start Lucky Logic and click the language version you want to install.

Starting Lucky Logic

The program should only be started if an interface is connected and being supplied with power by the separate power supply unit.

If you are using a PC-compatible computer, change to the drive on which you have installed Lucky Logic. This will normally be the hard disk:

C: <—|

Then select the Lucky Logic subdirectory:

```
CD LUCKYLOG      <—|
```

You can now start the program. Don't forget to specify the language if you want to use a non-German version:

```
LUCKYLOG        <—|  for German
LUCKYLOG E      <—|  for English
LUCKYLOG F      <—|  for French
LUCKYLOG N      <—|  for Dutch
```

If you do not want to have different colors on the screen when working with Lucky Logic (e.g. if you are using PC VGA graphics with a monochrome monitor), you can let the program know by calling it up as follows:

```
LUCKYLOG        M <—|  for German monochrome
LUCKYLOG E      M <—|  for English monochrome
LUCKYLOG F      M <—|  for French monochrome
LUCKYLOG N      M <—|  for Dutch monochrome
```

If your computer is an Atari, start Lucky Logic by double-clicking the program symbol.

How to use Lucky Logic

A welcome screen appears first of all when you start the program. Just press any key to begin work.

Important! *The program will only work correctly if the interface is connected and ready for operation, in other words if it is being supplied with power by the separate power supply unit.*

The top of the screen is reserved for a menu bar for selecting the various command groups. The remainder of the screen has been left free for the control program.

File	Run	Symbol	Editor No.1	Options	File: TEST

The mouse pointer (cursor) is displayed on the screen. When you move the mouse around, the movement of the cursor on the screen corresponds to your hand movement. The two mouse buttons activate the actual program functions, e.g. they are used to select a file or to draw a connector.

Clicking

Two steps are necessary to select a program function:

1. Move the cursor to a menu option (for example) with the mouse.
2. Select the option by pressing one of the mouse buttons (the left and right-hand buttons may have different functions - you will be told what they do at the appropriate times).

This method of making a choice is also known as "clicking".

The mouse is also used to position symbols and draw connectors when you produce drawings.

If you select a menu accidentally, move the mouse pointer away from it (so that none of the menu options are highlighted any more) and press:

- The right-hand mouse button if you have a PC
- The left-hand mouse button if you have an Atari.

The menu disappears again.

Before we continue, a few words of explanation are necessary about some of the general terms used in this manual:

Scrolling

This is the word used to refer to moving the screen or a window over the data. Scrolling is necessary, for example, whenever the logical flowchart takes up more than 24 lines and will no longer fit on the screen. The screen can be considered to form a window which is moved vertically over the drawing. You can scroll by clicking one of the two arrows in the right-hand margin of the window.

You can also scroll through a list of files in order to select one of them, if there are more files on the hard disk or floppy disk than there is room in the window.

Interface

The interface forms the link between the fischertechnik models and the computer, since the computer ports cannot provide enough power on their own to supply a motor, for example. In addition the interface protects the ports of the computer if you make a mistake when wiring up a model. It also incorporates an automatic timer, which cuts off the power to the motors if the computer stops sending control commands. You will often wish to make changes when testing the control software. The timer stops the model automatically, so that you don't have to interrupt the power supply to the interface every time you want to modify the program. The model carries on again as normal as soon as the computer sends more commands. It is also possible to connect two interfaces to the same computer (see interface operating manual). Lucky Logic is already configured for a second interface.

Process

A process is what controls an individual motor or - in more general terms - a particular output. Since the interface has 4 outputs, up to 4 "single processes" can be strung together in a "combined process".

A separate editor is responsible for each single process; it has the same number as the motor it controls, in other words editor 1 contains the control program for motor 1, editor 2 that for motor 2, etc.

All the single processes which make up a combined process are processed in parallel by the program, which means that all the motors and lamps connected to the outputs are controlled at the same time.

If two interfaces are connected to the computer (see interface manual), the number of inputs and outputs is doubled, making a total of 16 inputs and 8 outputs (and thus 8 processes) available.

Variables

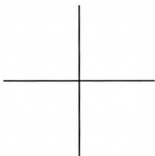
Lucky Logic uses variables numbered from 1 to 99 to buffer values (VAR 1, VAR 2, VAR 3, etc.). These variables are valid in all processes; as a result, the single processes can exchange information via the variables, for example one process can use a variable to inform another process that it has finished what it is doing.

***Important!** Since the variables are used by all the single processes, always choose the variable number carefully, so that the processes do not interfere with each other (in other words they must only interact where they are actually supposed to).*

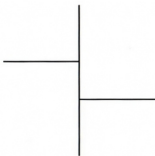
Connectors

When you have positioned the various symbols on the screen, you can join them up with connectors (lines); only horizontal and vertical lines are possible. First click an output. Then draw the connector with the mouse. Click the left-hand button to change directions. If you wish to join a connector up to another connector which already exists, simply move the cursor to this connector and click it. To delete a connector, move the cursor to the start of it (normally the output of a symbol) and click it with the right-hand mouse button.

***Important!** It is not possible to form more than one junction (i.e. join up connectors) at any point on the screen, in other words no more than three connectors may converge in the same place. If there are several return paths to a single line, the connectors must therefore be arranged one below the other.*



WRONG



RIGHT

Description of the menus

File

As soon as the cursor is positioned to the "file" command in the main menu, a pull-down menu appears. The desired file command can then be selected with the mouse pointer (the color changes). The command is executed when it is clicked with the left-hand mouse button. This main menu option contains all the commands for loading and saving processes on floppy disk or on the hard disk. The "file" option must also be selected in order to exit the program.

Load single process F3

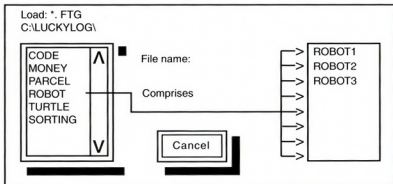
This menu option can be used to load a single process in the currently active editor (the number of the active editor is displayed in the top line next to the "editor" command). The number of the controlled motor or output is always the same as the number of the active editor. A logical flowchart which already exists can be loaded with this number and edited. If you want to control a new model, you can also load an existing logical flowchart and then adapt it to the model as necessary.

The files with single processes which already exist are listed in a window; the desired file can then be clicked with the mouse. If there are more files than there is space in the window, the list can be scrolled up or down by clicking the arrows.

It is also possible to string several processes together to form a combined process with this option: the various editors are each loaded with single processes and the combination of them is stored as a combined process.

Load combined process Alt-F3

This menu option can be used to load several processes which belong together, e.g. the complete control program for all the motors or outputs of a model. If the mouse pointer is positioned to a combined process, the single processes which make up this process are displayed:



The logical flowchart for all the motors can be either edited or compiled immediately (→ Run combined process) and started after the combined process has been loaded.

The combined process can be extended if desired by entering additional processes (in editors which are still free) or by loading single processes. The files which already exist (combined processes) are listed in a window; the desired file can then be clicked with the mouse. If there are more files than there is space in the window, the list can be scrolled up or down by clicking the arrows.

Save single process F2

This menu option saves the process which is currently displayed on the screen. There are two ways of selecting the file name:

- If the process already existed beforehand and has merely been modified, the file name can be clicked in the same way as when the process is loaded.
- If a new file name is to be allocated, the words "file name" must be clicked in the window. The new name can then be entered (all inputs must be terminated by pressing the [←] key).

If the file name exists, the program asks again whether or not you really want to overwrite the old file, just to be on the safe side. You should use different file names for different processes.

Save combined process Alt-F2

This menu option saves all loaded processes. There are two ways of selecting the file name:

- If the combined process already existed beforehand and has merely been modified, the file name can be clicked in the same way as when the process is loaded.
- If a new file name is to be allocated, the words "file name" must be clicked in the window. The new name can then be entered (all inputs must be terminated by pressing the [←] key).

Important! The old file is overwritten when you save a combined process! Don't save single processes and combined processes under the same name!

Clear screen Alt-C

This command can be used to clear the screen and create a new logical flowchart. If the flowchart which was previously displayed on the screen has not been saved (-> save single process), it will be irrecoverably lost. The program therefore always asks for confirmation. If you click "Cancel" at this stage, the screen remains as it is. If you click "Continue", everything on it is deleted.

Print logical flowchart Alt-P

This menu option can be used to print out the complete logical flowchart (in other words including the sections which are not visible on the screen at present).

A printout can be very useful - firstly so that you can file away the circuit for later use, and secondly it is often much easier to locate any errors in the circuit using a pencil and paper than by trial and error on the screen.

Important! The printer must be connected, switched on and ready to print, in other words paper must be loaded. (Swap the interface port and the printer port!)

Exit program Alt-X

This menu option terminates the Lucky Logic program.

If the circuit which was previously displayed on the screen has not been saved (-> save single process, -> save combined process), it will be irrecoverably lost. The program therefore always asks for confirmation. If you click "Cancel" at this stage, the screen remains as it is. If you click "Continue", everything on it is deleted.

Run

The "run" command in the main menu controls compilation of the processes, and is used to start a combined or single process or to test it step by step. As soon as the cursor is positioned to the word "run", a pull-down menu appears on the screen. The desired command can then be selected with the mouse pointer (the color changes). The command is executed when it is clicked with the left-hand mouse button.

Compile single process F9

This menu option can be used to check whether or not the circuit has been entered correctly for one process; the program checks the junctions and connectors of each symbol. If the circuit is correct, an OK message appears in a box in the middle of the screen. You can then start the process after clicking the message with the mouse. A process is only compiled if it has been saved beforehand.

If the circuit contains an error, explanatory information appears instead of the message and you must rectify it before you can continue.

Compile combined process Alt-F9

This menu option can be used to check whether or not the circuit has been entered correctly for all processes (similar to compiling single processes). All the single processes which are marked with a "√" in the editor menu are compiled consecutively. The combined process is only compiled if all single processes have been saved beforehand.

If an error has been made in one of the processes, the compilation procedure is interrupted and a message is output during the single process containing the error.

RUN single process Shift-F9

This menu option starts a single process. It is a useful option for testing the various control functions of a model step by step. If all the single processes run the way you want them to, you can test their interaction in the combined process. The process is executed and the model is controlled. You can stop the process again by pressing any key on the computer keyboard.

RUN combined process Ctrl-F9

This menu option simultaneously starts all the single processes which have been loaded - in other words all the input and output components in your model which are connected to the interface. The option can be used to test the interaction of the single processes and to start a complete control program. The control program is executed, and can be stopped again by pressing any key on the computer keyboard.

Symbol

The logical flowchart for a process is constructed by positioning the “symbols” (e.g. motors and switches) on the screen and then joining them together. You can then check the circuit with the compile command. The program checks whether or not all the symbol inputs and outputs are connected together and whether you made any mistakes when you designed the logical flowchart. The message which appears either tells you that the circuit is OK or indicates any errors.

You can access the Lucky Logic symbols by activating the “symbol” command in the main menu. Select the desired symbol with the mouse pointer (the color changes). When you click it with the left-hand mouse button, it is highlighted on the screen. You can then position the symbol where you want it in two steps:

- Move the pointer to any position on the screen and press the left-hand mouse button again; the symbol will be set at this point. You can repeat this step as often as you like until the symbol is positioned exactly where you want it.
- Then confirm the symbol's position by pressing the right-hand mouse button.

If you wish to reposition a symbol elsewhere later on, you must first delete all its connectors. You can then click the top left-hand corner of the symbol with the left-hand mouse button and move it to a new position as described above.

If you wish to delete a symbol, you must also delete all its connectors first. Then click the top left-hand corner of the symbol with the right-hand mouse button.



Each process begins with the “start” symbol. This symbol must therefore always be set first when designing a new circuit. It serves as the starting point for constructing the remainder of the circuit. If the process is a recurring process, the return path is joined up between the start symbol and the next symbol. Only one start symbol is set for each process.



If a process must only be run once, there is no return path (-> start). In this case the output of the last symbol is linked to the “end” symbol. It is possible to set several end symbols in the same circuit or to link several outputs to the same end symbol.

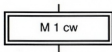


The “input” symbol represents an input line (switch or sensor). There are two output lines at the symbol - one for the value 0 and one for the value 1. The program continues executing either in the 0 branch or in the 1 branch, depending on the switch position (0 = switch connected to ground = not actuated, 1 = switch connected to +5 V = actuated).

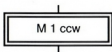
The input number can be entered by clicking the “E” with the left-hand mouse button and then keying in the number (all inputs must be terminated by pressing the [←] key). The two outputs of the symbol can be swapped by clicking the 1 output.



The “motor off” symbol switches off a motor. The motor number is the same as the number of the process (-> “editor”). The word “motor” of course also refers to any other components connected to the output, e.g. lamps, magnets, etc.



The “motor cw” and “motor ccw” symbols start the motor rotating either clockwise or counterclockwise (if the connected motor rotates in the wrong direction, you must swap its plugs round). The motor number is the same as the number of the process. The word “motor” of course also refers to any other components connected to the output, e.g. lamps, magnets, etc. You can change between clockwise and counterclockwise by clicking the “M” with the left-hand mouse button.





The "VARxx = 0" symbol introduces a variable into the circuit. "xx" represents the number of the variable. The variable is set to zero as default. All variables can be numbered consecutively from 1 to 99. The variable number can be entered by clicking the "V" of "VAR" with the right-hand mouse button and then keying in the number (all inputs must be terminated by pressing the [\leftarrow] key).

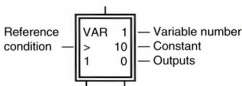
The variables apply to all the single processes which make up a combined process and serve as a means of exchanging data between the single processes. On the other hand, there is also a risk of errors creeping in if you use the same variable for several different processes.



The "VARxx = nnn" symbol enables a variable to be compared with a fixed value (= constant; xx represents the number of the variable and nnn is any number). If the current value of the variable is the same as the fixed value, the program continues at the 1 output. If not, it continues at the 0 output.



The outputs can be swapped by clicking the 1 output. Enter the variable number first by clicking the "V" with the left-hand mouse button, and then press [\leftarrow] to enter the reference value (= constant; all inputs must be terminated by pressing the [\leftarrow] key).



The comparison function can also establish whether the specified variable is lower (<) or higher (>) than a predefined value. To do so, click the "=" sign in the symbol. The reference condition changes to the next alternative each time you click it - just carry on clicking until the condition you want appears in the symbol.



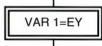
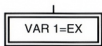
The "VARxx = VARyy" symbol enables two variables to be compared with one another (xx and yy are the numbers of the two variables). If the values of the two variables are identical, the program continues at the 1 output. If not, it continues at the 0 output. The outputs can be swapped by clicking the 1 output. You can enter the two variable numbers consecutively by clicking the first "V" with the left-hand mouse button (all inputs must be terminated by pressing the [←] key).



The "INC VARxx" symbol enables the value of a variable to be incremented by 1 (xx represents the number of the variable). The variable number can be entered by clicking the "1" of "INC" with the left-hand mouse button (all inputs must be terminated by pressing the [←] key).



The "DEC VARxx" symbol enables the value of a variable to be decremented by 1 (xx represents the number of the variable). The variable number can be entered by clicking the "D" of "DEC" with the left-hand mouse button (all inputs must be terminated by pressing the [←] key).



The "VARxx = EX" symbol causes a value of the analog input EX to be read in and a variable to be set to this value (xx represents the name of the variable). The variable number can be entered by clicking the "V" with the left-hand mouse button (all inputs must be terminated by pressing the [←] key). You can swap between the EX and EY inputs by clicking the "E" of "EX" or "EY".

Editor

The "editor" is used to enter a logical flowchart. There is a separate process for each output, and thus also a separate editor. This option in the menu can be used to select the control program for a particular process in order to "edit" it.

The editor can be selected by activating the "editor" command in the main menu at the top of the screen. As soon as the cursor is positioned to this command, a pull-down menu appears on the screen. The desired editor can then be selected and clicked with the mouse pointer.

If a process has already been allocated to the editor, the name of the file is displayed and the process is loaded.

If no processes have been allocated, a file name is not displayed. Editors 5 to 8 should obviously only be used if two interfaces are connected to the computer.

Once the editor has been selected, the logical flowchart can be edited. You can click the "√" symbol to switch compilation of the process on and off (-> compile combined process).

The number of the currently selected editor is the same as the number of the single process you want to edit, and thus also the number of the interface output (editor 1 is responsible for motor 1 and thus for single process 1, editor 2 for motor 2 and single process 2, etc.). The number is always displayed in the menu bar at the top of the screen.

Here are a few useful hints for working with the editor:

- A symbol cannot be moved again (i.e. repositioned) until all its connectors have been opened up. It is a good idea to order a printout of the program, so that you can still remember afterwards where the connectors were drawn.
- If you wish to reconstruct a logical flowchart, you do not necessarily need to delete all the symbols you no longer require for the time being (and then retrieve them again later via the menu); instead you can "park" them in another area of the screen where there is free space and then integrate them in the circuit again later on.
- The variables apply to all processes. If a variable is altered in one process, the same alteration is made instantaneously in all the other processes.

Options

The options menu only contains two functions, which are executed when you click the left-hand mouse button.

Help F1

This menu option provides information on all the functions of the program - it is basically a shortened version of the software manual for the computer. A menu with a list of keywords appears on the screen. If you click one of the keywords, a brief description of the command or function will be displayed.

Interface diagnosis

Lucky Logic can also be used to test the interface and the connecting cable. To do so, you must connect the motors to the outputs (M1 to M4) and the switches to the inputs (E1 to E8) (if you wish, you can use just one motor and one switch and then move them along one input or output at a time). If you are using two interfaces, you can also control inputs E9 to E16 and motors M5 to M8.

E 1	E 2	E 3	E 4	E 5	E 6	E 7	E 8	E 9	E10	E11	E12	E13	E14	E15	E16
1	1	1	1	1	1	1	1								

M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8
off	off	off	off				

X	Y
536	536

The input values of the switches appear in the top field. The display varies according to the switch positions.

The middle field is used for direct control of the outputs. The display is initially set to "off". You can toggle between "off" and "ccw" by clicking a motor field with the left-hand mouse button or between "off" and "cw" by clicking it with the right-hand button. There is obviously no difference between clockwise and counterclockwise as far as lamps and magnets are concerned.

The field in the bottom left-hand corner shows the values of the two analog inputs EX and EY. You can terminate the interface test by clicking the "cancel" field in the bottom right.

Important! You can only use the Lucky Logic diagnosis function if the interface is connected to the computer and being supplied with power by the separate power supply unit.

Examples

The examples below are designed to simplify your introduction to the program. All you need is the interface, one motor and two switches. The motor and the switches must be connected to the interface (the motor to M1 and the switches to E1 and E2). You can check whether or not the connections are correct with the diagnosis function described above. When you press the switches, the value displayed for E1 or E2 should change. You can control the motor by clicking M1.

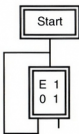
Example 1:

The first program switches the motor on with switch E1 and off again with switch E2. What you must enter to write the program and the functions of the various symbols are described below, step by step.

Select the "symbol" menu and click the start symbol. It appears on the screen in color. Go to the desired position on the screen with the mouse and click the left-hand button. The symbol then moves to where the mouse is. Confirm the position by clicking the right-hand button. Every program must begin with the start symbol.

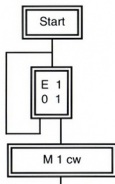


Position the input symbol in the same way. Click the "E" and enter "01" as the switch number. Click the "1" of "1 0"; the value displayed at the bottom changes. Then draw a connector between "Start" and "E 1", as well as a return path. If you need to change direction, just press the left-hand mouse button.



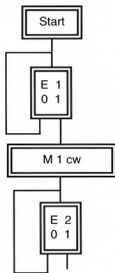
Function: The program waits until you press switch E1.

Select the "M 1 cw" symbol and position it just below the free output of "E 1". Then draw a connector between "E 1" and "M 1 cw".



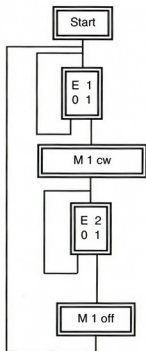
Function: The motor starts up as soon as the switch is pressed.

Now position switch E2 underneath the motor symbol exactly as before, and draw in a return path for it like switch E1.



Function: The program then waits with the motor running until you press switch E2.

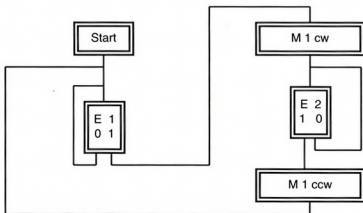
You must position the "motor off" symbol below "E 2", so that the motor can be stopped again. Then draw a connector between "E 2" and "M 1 off". You must finish by drawing a return path to a point below the "start" symbol, so that the motor can be switched on and off alternately with "E 1" and "E 2".



Function: the motor is now switched off and the sequence starts at the beginning again.

Example 2:

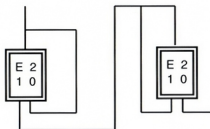
The second program switches the motor first to clockwise operation with switch E1 and then to counterclockwise operation with switch E2. This procedure can subsequently be repeated any number of times. Although the circuit looks different, it works in almost exactly the same way as the first one, except that "M 1 off" has been replaced by "M 1 ccw".



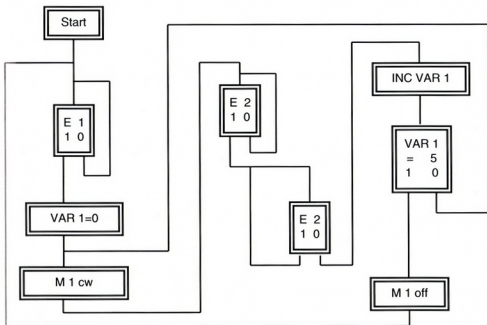
Example 3:

The last example shows how to count the number of times a switch is pressed. Start the procedure by pressing the switch connected to E1. The program then continues by setting VAR 1 to zero.

The motor now rotates clockwise. The purpose of the two consecutive queries regarding switch E2 is to establish one press of the switch (and one only). The program waits first of all until the switch is pressed. However, VAR 1 is not incremented by 1 until it is released again. This section of the circuit is shown below:



When the switch has been pressed a total of five times (e.g. by a momentary-action switch which is connected to the motor by a pulse wheel), the motor is stopped; the program waits for it to be started again with the switch at E1.



Matching Lucky Logic to the computer

Lucky Logic is matched to your computer automatically. The first time you start up the program, it determines which graphics adapter (PC) is installed in the computer and how fast your computer can calculate. This information is stored in the FISCHER.DAT file, and is loaded in future every time you start the program. If your PC causes you any problems, the reason is probably the analog-value measurements. There are two alternatives you can try, one of which will usually help:

- Jumper the EX and EY inputs (the smallest value is then measured). To do so, connect the yellow and green sockets together for EX and the orange and green sockets for EY.
- Set the PC to a lower clock frequency (turbo button). You can reset it to the fast frequency again after you have matched the software.

The program has been configured in the factory for use with a fast computer. This may lead to problems if your computer is a slow one (for example, the diagnosis function may indicate the inputs incorrectly). In this case:

1. Delete the FISCHER.DAT file.
2. Connect the interface to the power supply unit.
3. Restart Lucky Logic.

The program is now matched to your computer automatically. If you wish to run the program on another computer, or if you ever change your computer hardware, all you need to do to adapt Lucky Logic to the new situation is to follow the same procedure.

LUCKY LOGIC

English version

AMIGA

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Lucky Logic makes control so simple

The Lucky Logic program controls your fischertechnik models via the fischertechnik interface connected to the computer. Lucky Logic has an interactive user interface which is extremely simple to use; almost all actions can be performed with the mouse. All the program functions can be called up via menus. More experienced users can also call all the menu commands directly by means of hotkey codes (listed in the menus).

In order to be able to control a fischertechnik model, the computer needs some means of informing the interface which motors are supposed to turn and which lamps are supposed to light up. The computer can find out the positions of the different parts of a model by interrogating switches and light barriers. You can determine what you want your model to do by arranging the various switches, lamps and motors on the screen in the form of graphic symbols and then drawing connectors with the mouse, so that they look like a circuit with proper wires. The control program follows the connectors you have drawn according to the signals at the interface inputs, in order to activate the motors and lamps. If the state of an input changes, the signals take a different path through the drawing on the screen (the model is controlled by the computer). Lucky Logic also contains other elements for controlling the flow, namely variables, software counters and branches. You can design loops if you like by drawing return paths.

Installation

Lucky Logic is available for three different types of computer:

- IBM PC computers and compatibles,
- Atari ST,
- Commodore Amiga 500/2000/3000.

The package therefore contains four disks one 5 1/4" disk for PCs and one 3 1/2" disk each for PCs, Ataris and Amigas. The procedure for installing Lucky Logic on your computer differs according to the type of computer you have.

***Important!** You should make a backup copy of the disk before installing Lucky Logic. Your computer manual will tell you how to do so.*

The program already has the right format on the Amiga disk. Just insert the floppy disk and click the fischertechnik icon. You can then start the program.

If you want to install Lucky Logic on the hard disk, you must first click the LL-Install program, then press the Shift key and hold it down. Now select the workbench icon with the mouse and click it twice with the left-hand button. Release the Shift key again and follow the instructions provided by the installation program.

Starting Lucky Logic

***Important!** The program will only work correctly if the interface is connected and ready for operation, in other words if it is being supplied with power by the separate power supply unit.*

If you are using an Amiga, start Lucky Logic by double-clicking the program symbol.

How to use Lucky Logic

Lucky Logic is slightly different for the Amiga than for the Atari or a PC; it has been adapted to the standard conventions for Amiga programs. Once you have tried it out a few times, you will find that not that much has changed really. Perhaps the most obvious difference lies in the graphical symbols on the right-hand side of the screen. There are two ways of selecting symbols with the Amiga:

- Using the menu,
- Using the graphic symbols on the right-hand side of the screen.

If you decide to use the second alternative, you must click the desired symbol (with the left-hand mouse button), then position it wherever you want on the screen with the mouse. Click it again to confirm the position.

The menus

The menu bar at the top of the screen normally contains the most important information on the program which is currently running, the name of the file and the current editor.

Lucky Logic	File name: PARCEL	No. 1	

If you press the right-hand mouse button, the menus will appear on the screen. Hold the right-hand button down and drag it to the desired menu. If you move the mouse downwards, a pull-down menu will appear, and you can select the desired option in it with the mouse.

File	Run	Symbol	Editor	Options	

Clicking

Two steps are necessary to select a program function:

1. Move the cursor to a menu option (for example) with the mouse.
2. Select the option by pressing one of the mouse buttons (the left and right-hand buttons may have different functions - you will be told what they do at the appropriate times).

This method of making a choice is also known as "clicking".

The mouse is also used to position symbols and draw connectors when you produce drawings.

If you select a menu accidentally, move the mouse pointer away from it.

Before we continue, a few words of explanation are necessary about some of the general terms used in this manual:

Scrolling

This is the word used to refer to moving the screen or a window over the data. Scrolling is necessary, for example, whenever the logical flowchart takes up more than 24 lines and will no longer fit on the screen. The screen can be considered to form a window which is moved vertically over the drawing. You can scroll by clicking one of the two arrows in the right-hand margin of the window.

You can also scroll through a list of files in order to select one of them, if there are more files on the hard disk or floppy disk than there is room in the window.

Interface

The interface forms the link between the fischertechnik models and the computer, since the computer ports cannot provide enough power on their own to supply a motor, for example. In addition the interface protects the ports of the computer if you make a mistake when wiring up a model. It also incorporates an automatic timer, which cuts off the power to the motors if the computer stops sending control commands. You will often wish to make changes when testing the control software. The timer stops the model automatically, so that you don't have to interrupt the power supply to the interface every time you want to modify the program. The model carries on again as normal as soon as the computer sends more commands. It is also possible to connect two interfaces to the same computer (see interface operating manual). Lucky Logic is already configured for a second interface.

It is not possible to use two interfaces in conjunction with Lucky Logic on an Amiga 3000.

Process

A process is what controls an individual motor or - in more general terms - a particular output. Since the interface has 4 outputs, up to 4 "single processes" can be strung together in a "combined process".

A separate editor is responsible for each single process; it has the same number as the motor it controls, in other words editor 1 contains the control program for motor 1, editor 2 that for motor 2, etc.

All the single processes which make up a combined process are processed in parallel by the program, which means that all the motors and lamps connected to the outputs are controlled at the same time.

If two interfaces are connected to the computer (see interface manual), the number of inputs and outputs is doubled, making a total of 16 inputs and 8 outputs (and thus 8 processes) available.

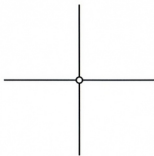
Variables

Lucky Logic uses variables numbered from 1 to 99 to buffer values (VAR 1, VAR 2, VAR 3, etc.). These variables are valid in all processes; as a result, the single processes can exchange information via the variables, for example one process can use a variable to inform another process that it has finished what it is doing.

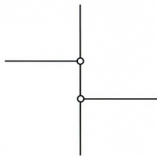
***Important!** Since the variables are used by all the single processes, always choose the variable number carefully, so that the processes do not interfere with each other (in other words they must only interact where they are actually supposed to).*

Connectors

When you have positioned the various symbols on the screen, you can join them up with connectors (lines); only horizontal and vertical lines are possible. First click an output. Then draw the connector with the mouse. Click the left-hand button to change directions. If you wish to join a connector up to another connector which already exists, simply move the cursor to this connector and click it. To delete a connector, move the cursor to the start of it (normally the output of a symbol) and click it with the right-hand mouse button.



RIGHT



RIGHT

Description of the menu bar

File

As soon as the cursor is positioned to the "file" command in the main menu, a pull-down menu appears. The desired file command can then be selected with the mouse pointer (the color changes). The command is executed when you release the right-hand mouse button. This main menu option contains all the commands for loading and saving processes on floppy disk or on the hard disk. The "file" option must also be selected in order to exit the program.

If you select the "load" or "save" option in the menu, a new menu will appear on the screen, offering a choice between a single process and a combined process. The file selection box which is typical of all Amiga programs is displayed. If you are working with a floppy disk, you must begin by selecting the drive

fischer:

and then the directory (drawer)

LL

Click the file you want in the list which then appears on the screen. If your Amiga only has one disk drive, it is a good idea to copy the original disk and then to delete a few of the sample programs from the copy, so that you have enough room for your own programs.

Load single process

This menu option can be used to load a single process in the currently active editor (the number of the active editor is displayed in the top line next to the "editor" command). The number of the controlled motor or output is always the same as the number of the active editor. A logical flowchart which already exists can be loaded with this number and edited. If you want to control a new model, you can also load an existing logical flowchart and then adapt it to the model as necessary. Of course, you can only load a single process if you have saved it beforehand.

Load combined process

This menu option can be used to load several processes which belong together, e.g. the complete control program for all the motors or outputs of a model.

Save single process

This menu option saves the process which is currently displayed on the screen. There are two ways of selecting the file name:

- If the process already existed beforehand and has merely been modified, the file name can be clicked in the same way as when the process is loaded.
- If a new file name is to be allocated, the words "file name" must be clicked in the window. The new name can then be entered (all inputs must be terminated by pressing the [←] key).

***Important!** The old file is overwritten when you save a combined process! Don't save single processes and combined processes under the same name!*

Save combined process

This menu option saves all loaded processes. There are two ways of selecting the file name:

- If the combined process already existed beforehand and has merely been modified, the file name can be clicked in the same way as when the process is loaded.
- If a new file name is to be allocated, the words "file name" must be clicked in the window. The new name can then be entered (all inputs must be terminated by pressing the [←] key).

***Important!** The old file is overwritten when you save a combined process! Don't save single processes and combined processes under the same name!*

Delete page

This command can be used to clear the screen and create a new logical flowchart. If the flowchart which was previously displayed on the screen has not been saved (-> save single process), it will be irrecoverably lost. The program therefore always asks for confirmation. If you click "Cancel" at this stage, the screen remains as it is. If you click "Continue", everything on it is deleted.

Print logical flowchart

This menu option can be used to print out the complete logical flowchart (in other words including the sections which are not visible on the screen at present).

A printout can be very useful - firstly so that you can file away the logical flowchart for later use, and secondly it is often much easier to locate any errors in the flowchart using a pencil and paper than by trial and error on the screen.

***Important!** The printer must be connected, switched on and ready to print, in other words paper must be loaded. (Swap the interface port and the printer port!)*

Exit program

This menu option terminates the Lucky Logic program.

If the circuit which was previously displayed on the screen has not been saved (-> save single process, -> save combined process), it will be irrecoverably lost. The program therefore always asks for confirmation. If you click "Cancel" at this stage, the screen remains as it is. If you click "Continue", everything on it is deleted.

RUN

There are only two options in this menu - "RUN single process" and "RUN combined process". The processes are compiled automatically. You can stop the program at any time by pressing either any key on the keyboard or one of the mouse buttons.

Symbol

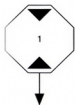
This menu provides access to the symbols for the Lucky Logic programs. The logical flowchart of a process is constructed by arranging the symbols for the fischertechnik elements on the screen and connecting them together with lines.

The graphic symbols for the Lucky Logic elements can be fetched directly with the mouse by clicking them at the right-hand margin of the screen, and then positioning them. They can also be selected in the "symbol" menu. When you have positioned the symbol, a window in which you can enter the necessary information is opened.

Click the desired field to make an input. The input is then shown in « ». Numeric inputs (variable numbers, constants, etc.) must be made at the keyboard. Other inputs can be made by pressing the left-hand mouse button repeatedly until the value you want appears in the field.

Finally, click the "continue" field to make the menu disappear again. If you have made a mistake, or if you only wanted to check the input, click "cancel" instead and the original values will remain set. The symbols are described in detail below.

Label



Set label	
Label no.	[1]
Start here?	[yes]
Continue	Cancel

← (1)
← (2)

You are allowed to use labels in the Lucky Logic version for the Amiga (like the line numbers in the BASIC program). You can set labels anywhere in the program and then jump to them. This facility is designed to simplify the drawing process: instead of having to draw a long return path, you can now use a label and a jump instead.

When you set a label, a menu appears on the screen; you can enter the label number in it and specify whether or not this label is to be the start number.

- (1): Enter the label number here and press ←
- (2): Click either "yes" or "no" with the mouse.

Jump to label



Jump to label	
No.	[1]
Continue	Cancel

← (1)

This option allows you to jump to a particular label. Enter the number of the target label in the menu. It is a good idea to allocate target labels before you start, so that you can choose to jump to them later on.

- (1): Enter the label here and press ←

Branch with label



Branch with label	
No.	[1]
Continue	Cancel

← 1

This is a new option for using so-called subroutines in the program. The main purpose of it is to simplify complex flowcharts; it is not required for the kit models.

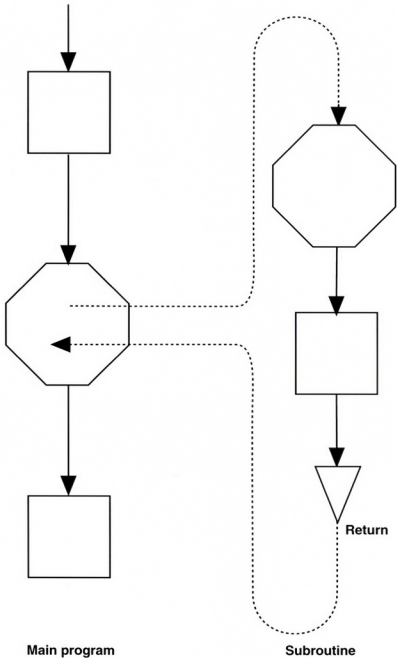
The subroutine always begins with a label and ends with a return symbol. Whereas "jump to label" enables you to carry on working at the selected target label, "branch with label" causes a subroutine to be run first until you reach the return symbol; the program then returns to the symbol following the label from which you branched. The system works like GOSUB and RETURN in BASIC, for example.

Simply enter the number of the target label in the menu.

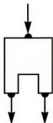
Return symbol



Jump to subroutine



Condition



This symbol contains all the comparisons, in other words both the inputs and the comparisons of the variables with one another and with constants. All the information concerning the conditional branch can be entered in the window which appears.

Set condition			
1st argument	[«input»]	[«1 »]	← (1)
Comparison	[«equal to»]		← (2)
2nd argument	[«constant»]	[«1 »]	← (3)
Output	[0 ccw / 1 cw]		← (4)
Continue		Cancel	

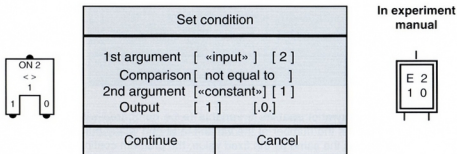
(1), (3): You can switch between the two elements to be compared by clicking them with the mouse. The possible choices are as follows: input/variable/analog input EX/analog input EY/constant.

You can enter the variable number, the input number or a numeric value (constant) next to these.

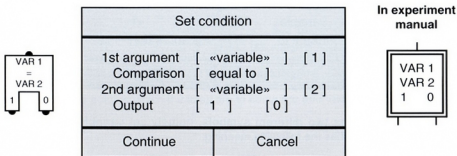
(2): Select the desired comparison of argument 1 and argument 2 with the mouse button:
equal to/not equal to/greater than/greater than or equal to/less than/less than or equal to.

(4): You can swap the assignments of the outputs here by clicking them with the mouse (0 output and 1 output).

When you have finished making the inputs (click "continue"), the assignment appears on the symbol as well. The examples below show how the symbols for "input", "compare variables" and "compare constants" are represented.



The "input" symbol represents an input line (switch or sensor). There are two output lines at the symbol - one for the value 0 and one for the value 1. The program continues executing either in the 0 branch or in the 1 branch, depending on the switch position (0 = switch connected to ground = not actuated, 1 = switch connected to +5 V = actuated).



The "VARxx = VARyy" symbol enables two variables to be compared with one another (xx and yy are the numbers of the two variables). If the values of the two variables are identical, the program continues at the 1 output. If not, it continues at the 0 output.



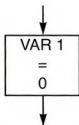
Set condition		
1st argument	[«variable»]	[1]
Comparison	[equal to]	
2nd argument	[«constant»]	[10]
Output	[1]	[0]
Continue		Cancel

In experiment manual



The "VARxx = nnn" symbol enables a variable to be compared with a fixed value (= constant; xx represents the number of the variable and nnn is any number). If the current value of the variable is the same as the fixed value, the program continues at the 1 output. If not, it continues at the 0 output.

Variable



Set variable	
variable	[«1»]
Equal to	[«constant»][«2»]
Continue	Cancel

← (1)
← (2)

This symbol combines two different symbols, namely set variable and increment / decrement. The menu has the following meaning:

- (1): Enter the variable number here (don't forget to click the field first).
- (2): Use the mouse to click the initial value to which you want to set the variable. It can be a constant value, another variable or an input.

You can also select "inc" (increment) or "dec" (decrement) to increase or decrease the value of the variable.

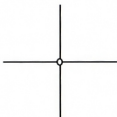
Motor



Motor control	
Operation	[«off»]
Continue	Cancel

This symbol inserts a motor (or an output in general). You can change between "ccw", "cw" and "off" in the motor menu by means of the mouse.

Node



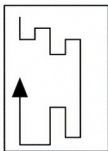
In order to join two lines together (e.g. with a return path), you must first set a node at the intersection or at the point at which the lines are to converge and then draw the line.

Scrolling



The arrow symbols and the scrollbar enable you to select a desired section of the circuit.

Wiring



When you click this icon, you can draw connectors between the symbols with the mouse. Only vertical and horizontal lines are allowed (if you try to draw an oblique line, it will appear on the screen, but the screen will flash to indicate the error).

Always start with an output. Just click the mouse once to change directions. If you click the input of another symbol, the connector will end there automatically.

Delete



When you click this icon, you can delete connectors and symbols again. To delete a connector, click the beginning of it (usually the output of a symbol). A symbol cannot be deleted until there are no more connectors leading to or from it.

Move



You can click this icon in order to move symbols. Then click the symbol you wish to move with the mouse and move it to its new position. Press the left-hand mouse button again to confirm the symbol's new position. If you move symbols which have already been connected, the nodes will be deleted automatically.

Change



If you click the pencil icon, you can alter the settings of the various symbols at a later stage (e.g. you can change the motor from counterclockwise to clockwise). If you click a graphic symbol, its input menu will be opened and you can alter the values in the same way as when you position it for the first time.

Editor

There are a number of differences here as compared with the PC version. The editor menu has three submenus - "show page", "set start" and "ignore".

Show page

Another submenu, in which you can select an editor, appears on the screen. The program for controlling a particular output is processed, in other words. "Page 1" = "output 1", etc.

Set start

This option is new to the Amiga! You can set so-called "labels" in the program. This option defines the label at which the program starts running. You can set the start label anywhere you want with the Amiga. A large menu, in which you can enter the start label for each editor, is opened here (see also "label").

Select start label	
Page 1	[« 1 »]
Page 2	[2]
Page 3	[3]
Page 4	[4]
Page 5	[5]
Page 6	[6]
Page 7	[7]
Page 8	[8]
Continue	Cancel

Click the number field of the desired editor to make an input. The number is then displayed in « » (as shown above for page 1). You can now enter the number of the label at the keyboard.

Finally, click the "continue" field to make the menu disappear again. If you have made a mistake, or if you only wanted to check the input, click "cancel" instead and the original values will remain set. The same procedure applies to all input menus.

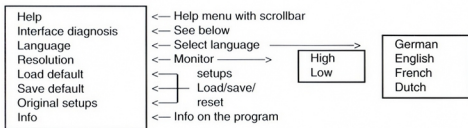
Ignore

This option determines which editor is active for "RUN combined process" (in the PC version the active editors are the ones marked "√"). In this context "ignore" means that the editor is not used (the output remains "idle"), while "RUN" means that the output is "activated".

Select pages to ignore		
Page 1	[«ignore»]	
Page 2	[Run]	
Page 3	[Run]	
Page 4	[Run]	
Page 5	[Run]	
Page 6	[Run]	
Page 7	[Run]	
Page 8	[Run]	
Cancel		Continue

Options

The options menu has been extended for the Amiga. You can choose between German and English and between a high or low screen resolution. You can either save these setups and load them again later or change them back to their original values.



Help

This menu option provides information on all the functions of the program - it is basically a shortened version of the software manual for the computer. A menu with a list of keywords appears on the screen. If you click one of the keywords, a brief description of the command or function will be displayed.

Interface diagnosis

Lucky Logic can also be used to test the interface and the connecting cable. To do so, you must connect the motors to the outputs (M1 to M4) and the switches to the inputs (E1 to E8) (if you wish, you can use just one motor and one switch and then move them along one input or output at a time). If you are using two interfaces (not possible with the Amiga 3000), you can also control inputs E9 to E16 and motors M5 to M8.

E 1	E 2	E 3	E 4	E 5	E 6	E 7	E 8	E 9	E 10	E 11	E 12	E 13	E 14	E 15	E 16
1	1	1	1	1	1	1	1								

M 1	M 2	M 3	M 4	M 5	M 6	M 7	M 8
off	off	off	off				

X	Y
536	536

The input values of the switches appear in the top field. The display varies according to the switch positions.

The middle field is used for direct control of the outputs. The display is initially set to "off". You can toggle between "off" and "ccw" by clicking a motor field with the left-hand mouse button or between "off" and "cw" by clicking it with the right-hand button. There is obviously no difference between clockwise and counterclockwise as far as lamps and magnets are concerned.

The field in the bottom left-hand corner shows the values of the two analog inputs EX and EY. You can terminate the interface test by clicking the "cancel" field in the bottom right.

***Important!** You can only use the Lucky Logic diagnosis function if the interface is connected to the computer and being supplied with power by the separate power supply unit.*

Examples

The examples below are designed to simplify your introduction to the program. All you need is the interface, one motor and two switches. The motor and the switches must be connected to the interface (the motor to M1 and the switches to E1 and E2). You can check whether or not the connections are correct with the diagnosis function described above. When you press the switches, the value displayed for E1 or E2 should change. You can control the motor by clicking M1.

Example 1:

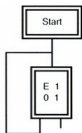
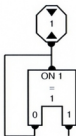
The first program switches the motor on with switch E1 and off again with switch E2. What you must enter to write the program and the functions of the various symbols are described below, step by step.

Select the "symbol" menu with the left-hand mouse button and then click the "start" symbol. It appears on the screen in color. Go to the desired position on the screen with the mouse and click the left-hand button. The symbol then moves to where the mouse is. Confirm the position by clicking the right-hand button. Every program must begin with the "start" symbol.



← In experiment manual

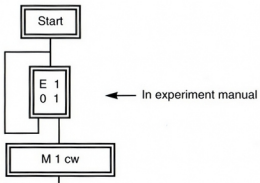
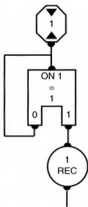
Position the input symbol in the same way and enter "01" as the switch number. Click the "1" of "1 0"; the value displayed at the bottom changes. Then draw a connector between "Start" and "E1", as well as a return path. If you need to change direction, just press the left-hand mouse button.



← In experiment manual

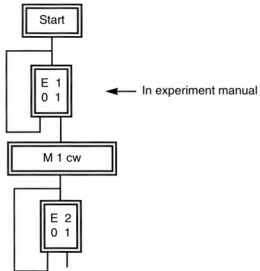
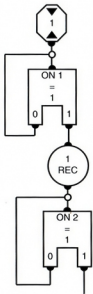
Function: The program waits until you press switch E1.

Select the "M 1 cw" symbol and position it just below the free output of "E1". Then draw a connector between "E1" and "M 1 cw".



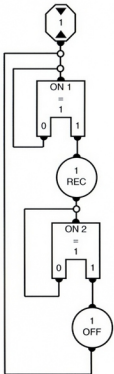
Function: The motor starts up as soon as the switch is pressed.

Now position the "E2" switch underneath the motor symbol exactly as before, and draw in a return path for it like switch E1.

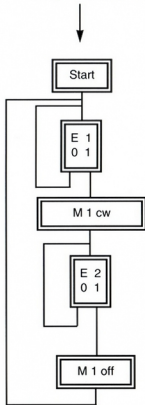


Function: The program then waits with the motor running until you press switch I2.

You must position the "motor off" symbol below "E2", so that the motor can be stopped again. Then draw a connector between "E2" and "M 1 off". You must finish by drawing a return path to a point below the "start" symbol, so that the motor can be switched on and off alternately with "E1" and "E2".



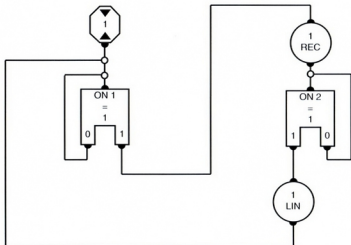
In experiment manual



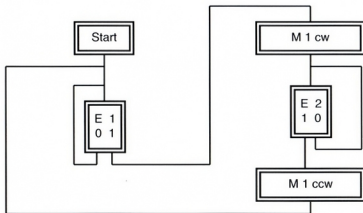
Function: The motor is now switched off and the sequence starts at the beginning again.

Example 2:

The second program switches the motor first to clockwise operation with switch E1 and then to counterclockwise operation with switch E2. This procedure can subsequently be repeated any number of times. Although the logical flowchart looks different, it works in almost exactly the same way as the first one, except that "M 1 off" has been replaced by "M 1 ccw".



In experiment manual



Other programs on the disk

The Lucky Logic disk also contains other programs for controlling some of the models in the Profi Computing kit. The programs for the PC have been written in Turbo-Pascal; when you install them, they are saved in a separate subdirectory as sources and as executable programs.

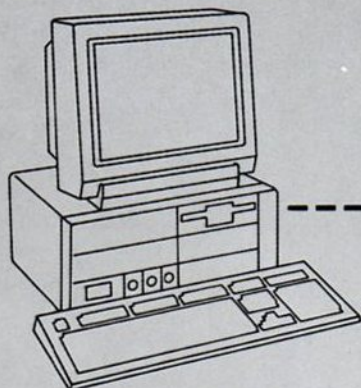
The programs for the Atari and the Amiga have been written in C, because Pascal compilers are not as common for these computers. The executable programs are contained in the "models" drawer of the Amiga and the sources in the "source" drawer. The Atari stores everything in the "C" subdirectory.

Check list: Problems and possible causes

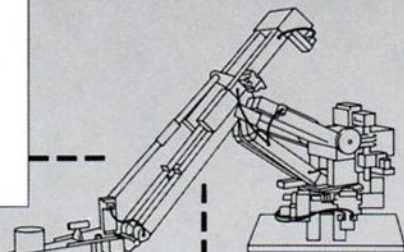
Problem	Possible cause
The diagnostic program displays 1 for E1 to E8, although no model is connected.	The interface is not connected to the computer or is not being supplied with power (the power supply unit is not connected).
One of the inputs E1 to E8 shows the opposite result from what you would expect when the switch is actuated.	The opening and closing functions of the switch have been reversed.
One of the inputs E1 to E8 always shows 0, although it is connected and has been actuated.	Check for a fault in the wiring, e.g. plug loose, wiring incorrect, cable defective.
One of the inputs E1 to E8 always shows 1, even though no model is connected.	The input gate IC 4014 is probably defective, e.g. due to overvoltage or electrostatic charging.
A motor output does not work.	Check for a fault in the wiring, e.g. plug loose, wiring incorrect, cable defective.
A motor output only works in one direction.	The power stage of the interface is defective.
A motor rotates very slowly or only works intermittently.	The power supply unit is overloaded by too many motors (use either a second power supply unit or the power supply Part no. 30180). The power supply unit has not been turned up far enough when using the adjustable output.

If you have any technical problems, don't hesitate to get in touch with us at:

fischertechnik Service Department
phone 07443/12-369
D-7244 Waldachtal/Tumlingen



fischertechnik
INTERFACE
30 520



fischertechnik Model
or
fischertechnik Kit
PROFI COMPUTING
30 336

fischertechnik
LUCKY LOGIC
30 521

Process Control
Software

fischertechnik
SPECIAL
POWER-SUPPLY
30 180

Accessories required: INTERFACE (can be daisy-chained) Power pack (we recommend art. no. 30 180 POWER-SUPPLY, 230 V~/8V ---)

Nécessitent en plus: INTERFACE (2 pièces connectables) Bloc d'alimentation (nous recommandons l'art. réf. n° 30 180 POWER-SUPPLY 230 V~/8V ---)

Verder zijn nodig: INTERFACE (2 stuks aansluitbaar) Voedingseenheid (aanbevolen art. nr. 30 180 POWER-SUPPLY 230 V~/8V ---)